The object of the present investigation was to study the effect of annealing on the strength of bond between the components of various bimetallic strips fabricated by the usual pressure-welding (cold-rolling) method. The following were included in the experimental materials: pure aluminium; alloy AMK (Al-0.5% Si-0.5% Mn); Al-20% Sn alloy; Moren-400 (Al-4% Si); ASS-6-5 (ASS-6-5) alloy (Al-6% Sn-5% Pb-0.5% Mg). In the first series of experiments the Al/Al, Al/Al-20% Sn and Al-20% Sn/AMK bimetal strips were studied, the last of these being fabricated with and without a treatment which entailed tinning of the Al-20% Sn alloy surface with tin squeezed out of the alloy itself.

Wedge-shaped sandwiches were used in every case so that the reduction in the first rolling-pass varied from 40% at one end of the strip to 80% at the other, a uniform reduction of 36% being given in the second pass. Shear-strength tests were carried out on suitably prepared bimetal specimens, both in the as-rolled condition and after 30 min annealing at 350, 450 and 550 °C. The shear strength of each individual metal given similar treatment was also determined. The results can be summarized as follows:

1) the shear-strength of cold-worked pure aluminium was not affected by the annealing, that of the AMK alloy increased from 8.3 kg/mm² after rolling to 11 kg/mm² after annealing at 550 °C, the corresponding figures for the Al-20% Sn alloy being 7 and 5 kg/mm²; 2) the shear strength of the bond in bimetal specimens after any given treatment corresponded to the strength of the weaker component given similar treatment, the AMK/Al-20% Sn bimetal strip prepared without surface-tinning treatment was an exception, its strength falling rapidly with increasing annealing temperature (8.4 kg/mm² after rolling, 2.8 kg/mm² after annealing at 550 °C); 3) the bond strength of the bimetal specimens was not affected by the degree of reduction in the first rolling operation. In the second series of experiments bimetal strips, consisting of mild steel on the one hand and AMK, Moren-400, aluminium and ASS-6-5 on the other, were studied (it was not possible to fabricate steel/Al-20% Sn bimetal strip under the conditions employed). In this case, the sandwich comprised metal strips of uniform thickness, pressure-welding being attained by cold-rolling each sandwich to 36% reduction. The shear strength of each combination was measured after rolling and after annealing at 350, 450, 500, 520, 540, 560, 600 and 620-640 °C. The following results were obtained: immediately after rolling the shear strength of the bond was similar to that of the appropriate Al-base alloy; all the bimetal specimens could be annealed at temperatures up to 450 °C without affecting the strength of the bond; the shear strength of the steel/ASS-6-5 bimetal decreased to nil after annealing at temperatures higher than 500 °C, the corresponding critical annealing temperatures for other bimetals being 560 for steel/Al, 600 °C for steel/Moren-400 and 620-640 °C for steel/AMK. There are 2 tables and 1 figure.